*Background on --*

# WATER-RELATED ACTIVITIES OF THE UNITED STATES DEPARTMENT OF AGRICULTURE



U. S. DEPARTMENT OF AGRICULTURE • MAY 1967

BACKGROUND ON --



# WATER-RELATED ACTIVITIES OF

# THE UNITED STATES DEPARTMENT OF AGRICULTURE

The vast water conservation activities of the U. S. Department of Agriculture (USDA) touch the lives of all Americans -- farmers and ranchers, food consumers and processors, hunters and fishermen, factory workers and clerks, highway builders and urban planners and developers, water skiers, and bird watchers.

These activities extend from the forested mountains down through the hills, across farmlands into rural communities, to the doorsteps of urban dwellers and to the water supply in their homes.

The USDA administers programs dealing with conserving and developing nearly 81 percent of the Nation's total land -- all the cropland and grassland, all the pasture and range land and all the forest lands in the National Forests and in private ownership.

The USDA has "first" Federal responsibility for help in conservation and wise use of the water that falls on this nearly 81 percent of the Nation's land. It has extensive programs of protecting water quality and of controlling, conserving, and developing water where it falls -- on the private lands used for agricultural and other purposes and on the forests, both public and private.

Because water first becomes available for use and management when it falls on the land, the characteristics of the land and how it is used and managed, and the plant cover it sustains, have a great deal to do with the way water moves into, over, and through the soil.aa

The U. S. Department of Agriculture's programs related to water include:

Research, much of it in cooperation with the State Agricultural Experiment Stations.

Educational assistance through the cooperative programs of the USDA and the Land Grant Universities in the States.

Technical assistance through local soil and water conservation districts and State forestry agencies, the Watershed Protection and Flood Prevention Program, Resource Conservation and Development (RCD) projects, Snow Surveys and Water Supply Forecasts, and to other Nations.

Multiple-use management of the 187 million acres of National Forests and National Grasslands.

Credit to individuals and groups, and to local sponsoring organizations of watershed projects and Resource Conservation and Development projects.

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Cost-sharing with individuals and groups in establishing certain conservation measures on private lands, and in small watersheds and RCD projects, Great Plains Conservation Program, Agricultural Conservation Program, Cropland Adjustment Program, Greenspan, Cropland Conversion Program, Appalachian Land Stabilization and Conservation Program, and through State forestry agencies.

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For additional information on USDA's programs involving water, write Director of Information, U. S. Department of Agriculture, Washington, D. C. 20250

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Following are highlights of U. S. Department of Agriculture activities related to water.

## EDUCATION

USDA has a traditional role in informing people about water resources and how to plan, organize and implement solutions to water problems. It is a major source of information at the Federal, State, and county level because of its own knowledge and programs in the water field and its close ties with the land-grant college system.

Cooperatively employed agents in the counties and areas and specialists at each Land-Grant University help inform individual farmers and groups on how to make efficient use of water to obtain the most economical agriculture production. They help rural communities find ways to improve their water supply for food processing plants, recreation, and other uses. They are involved in educating the public in efforts to conserve water and control water pollution.

They help local people to plan and organize small watershed projects, including recreational developments, and to develop conservation programs applicable to the water and related land resources of the country.

## RESEARCH

Developing sound technology to conserve and use soil and water resources on the Nation's farm and ranch lands is a major research responsibility of the Department. USDA carries on a nationwide cooperative research program designed to provide specific information on hydrologic characteristics of agricultural watersheds relating to soil and water conservation, water yield, reduction of flood and sediment damages, including hydraulics of structures for conserving soil and water; nature and origin and control of sedimentation in reservoirs, streams and valleys; improved cultural practices for controlling soil erosion and water runoff, improvement of physical condition of soils, water storage and use by plants, drainage, irrigation, and salinity control; and relation of quality of plant materials grown under differing soil conditions to nutritional disorders in animals.

About 420 scientists, covering 17 widely varying disciplines, are engaged in this work. The nationwide program is organized for convenience and efficiency into three main categories: (1) watershed engineering research; (2) water management research; and (3) soil management research. Information on these subjects is gathered through the activities of seven branches, organized by geographic regions.

There is one pioneering Research Laboratory -- the Mineral Nutrition Laboratory -- located at Beltsville, Maryland. Six national laboratories are incorporated into the various branches: U. S. Plant, Soil, and Nutrition Laboratory, Ithaca, New York; U. S. Sedimentation Laboratory, Oxford, Mississippi; U. S. Salinity Laboratory, Riverside, California; U. S. Water Conservation Laboratory, Tempe, Arizona; U. S. Soils Laboratory, and U. S. Hydrograph Laboratory, Beltsville, Maryland.

There are 14 other centers and several experimental watersheds. All of these, plus about 90 field locations, contribute to the research program. Close cooperative relations are maintained with other Federal and State agencies, State agricultural experiment stations, educational institutions, and industry.

Foreign Research Grants

The Department makes grants to foreign universities and other overseas research organizations to conduct soil and water research of mutual benefit to the United States and the foreign nation involved. Currently, for example, the purification of sewage water is being studied in India. West Pakistan scientists are trying to develop a solar-powered pump for bringing well-water to irrigated lands. In Israel, research is being conducted on the improvement of irrigation sprinklers, how plants use water, how to minimize soil water loss by evaporation, and how to improve the collection of rainfall for farm use. These studies are being supported with USDA grants paid for with foreign currencies obtained by the United States from sales of farm products abroad under Public Law 480.

Economic Research

The Department carries on extensive economic research related to water. Field studies are being made to cope with problems of developing and conserving the Nation's natural resources. Water resources are considered in four special ways: River basin planning, watershed program analysis, water quality, and water rights.

Agriculture is the prime user of land and water. The water available to a region depends partly on how the farms and forests make use of the resource.

Projections of how the Ohio River Basin will look in 1980 and in 2010 with and without agricultural water management typify some of the economic studies. The region would have sufficient agricultural land and water in 1980. But by 2010, large chunks of marginal land will be needed if technology gains assumed are realized. The calls for drainage and irrigation will mount, especially for vegetable and other speciality crops.

Smaller than the major river basins, but equally important, are the many smaller watersheds fed by tributaries and streams. In this area of research the Department analyzes flood damages in small watersheds, benefits and costs of recreational development, local secondary effects of watershed development programs, socio-economic factors of watershed organizations, and the economic effects of individual farm and community water conservation programs. Also evaluated is how well watershed and other water management programs work once they are begun.

Although much water pollution results from industrial wastes, part of it originates on farms due to soil erosion, animal wastes, and residues of chemical fertilizers and pesticides. The problems and causes of water pollution must constantly be studied and alternative solutions analyzed.

All States have water-rights laws, overlaid by regulations and the varying interpretations of local governments. In one study, specialists are compiling the water-rights laws of Western States, plus Hawaii; in another, they are compiling the laws of Eastern States. The reports will comprise the first national overview of water-rights laws of individual States. In time, these studies and others will help cope with the often conflicting demands for agricultural water needs in today's complex society.

Forestry Research

In forestry, watershed research programs are conducted through 10 Forest and Range Experiment Stations. Some field installations have achieved international fame from their development of basic knowledge on the movement of water through forest soils, on the effect of various plant covers on water gain and loss, and on methods of conserving moisture in mountain snowpacks. No less valuable have been the scientific advances in reseeding forests and rangelands and in techniques of soil stabilization. These and many other accomplishments have vastly enlarged the opportunities for all forest land managers, whether Federal, State, or private, to do a better job of keeping America's watersheds in good condition to serve man's perpetual and critical need for water.

## TECHNICAL ASSISTANCE

Technical responsibilities and contributions of the Department of Agriculture as they apply to water on private lands are many and varied.

Water Management for Erosion Control

An objective of water conservation is the efficient use of water on land to help supply the food and fiber needs of people. Another is the protection of land from damage from water runoff as it passes over the land's surface. Through the development of scientific farm and ranch conservation plans, and the application of soil and water conservation practices as needed and in proper order, 2 1/2 million landowners cooperating with local Soil and Water Conservation Districts and USDA programs are regularly engaged in conserving the Nation's water resources.

Among the measures used to protect the soil and at the same time make efficient use of moisutre available are contour cultivation, planting protective cover crops and trees, terracing and grassed waterways to carry excess runoff water safely from fields, strip cropping, crop rotations, and structures to control gullies.

Water Development

Water in ponds from surface flow or groundwater, from springs and from wells is essential in the operation of many farms and ranches. USDA has given technical help to more than 2 million landowners in locating and building farm and ranch ponds and dams for various uses.

Irrigation

Agriculture is the largest user of water, although industrial and domestic users are requiring more water each year. USDA's conservationists give technical help to landowners in designing and improving irrigation systems and in applying

conservation techniques in the use of irrigation water for crops. Conservation irrigation methods usually reduce the water needed by about half. Land resources are more efficiently used, and additional savings come from reduced costs in labor and maintenance.

Small Watershed Programs

Most upstream watersheds are recognized as opportunities for community improvement, for conserving and managing water resources, for industrial and business expansion, for recreation, and for making living better in various ways.

In over 800 small watershed projects -- up to 250,000 acres in size -- in which the people have used USDA technical and financial help, local people have achieved protection from floods worth $41,000,000 a year on the average.

In addition to floodwater reduction -- usually a primary purpose -- the watershed projects usually provide other benefits, some of which are paid for entirely or in part by local people. Water for domestic use and for industry, water for livestock, fire control, and irrigation and for various kinds of recreation such as fishing, swimming, boating, and hunting are among the additional benefits.

The USDA Inventory of Conservation Needs shows that 8,300 small watersheds would benefit from development and improvement under USDA's Watershed Protection and Flood Prevention program, with benefits to be realized well above the cost.

Other nations have been drawing on the experience of the USDA in developing watershed projects and in training their own specialists and engineers in carrying on watershed work.

River Basin Investigations

In the major river basins, USDA, in cooperation with other Federal and State agencies, has comprehensive studies under way to appraise the possibilities for developing water and related land resources to meet short and long-term national needs.

The studies identify needs and opportunities for controlling and removing excess water from agricultural, urban and industrial areas, supplying and managing water for agricultural production, supplying water to meet rural, urban and industrial needs, impounding water for recreation, for fish and wildlife enhancement and water quality control, and providing dependable supplies for power production and navigation. USDA is participating in 43 river basin studies.

Sediment Reduction

Until recent years farmland was thought to be the greatest source of sediment that fills stream channels and reservoirs and pollutes the Nation's waters. More recent investigations show that the amount of sediment carried away from land under urban and suburban development matches or surpasses that from farmland. For example, studies in the Potomac River Basin show that while farmland may contribute as high as 500 tons of sediment per square mile per year, soil lost from urban developments may run as high as 30,000 tons per square mile per year.

USDA's conservationists are working with local groups, including land developers and contractors, in applying measures to reduce greatly the sediment yields from these developments as well as from agricultural sources.

Snow Surveys

USDA, cooperating with other Federal and State and local agencies, makes snow surveys in the Western Mountains and forecasts the spring and summer water supply that will be available for all users. Snow surveyors cover 75,000 miles during winter over hazardous mountain terrain to measure the snow and its moisture content.

## FORESTRY

The Department of Agriculture is responsible for conserving forest lands and their renewable natural resources. It follows the principle of multiple use management for sustained yields of wood, water, wildlife, forage, and outdoor recreation. The work is divided into three areas: Administration of the National Forest System, cooperative programs with States and private landowners, and forestry research.

Watershed Management

The 154 National Forests and 19 National Grasslands are appropriately known as "Lands of Many Uses." These 187 million acres of public lands demonstrate multiple use in action, providing many public benefits through wise resource use. Few benefits, however, can be considered as essential as the supply of clean water for farms, homes, and industry. In the West, more than half the available water flows from the National Forests; in the East, National Forests protect the headwaters of major rivers.

From their earliest establishment, the National Forests have been recognized as primary sources of water. The Act of June 4, 1897, which provided the first management of the National Forests, specified that they were established "...for the purpose of securing favorable conditions of water flow..." The Weeks Law of 1911 authorized the purchase of private lands for National Forests where they might be " ... necessary to the regulation of the flow of navigable streams ..." Today, because of a growing population and expanding industry, the job of providing water is more important than ever.

On the National Forests the first task is to protect watersheds from fire, overgrazing, and other destructive influences. But new water demands call for new techniques. As a direct result of intensive research, USDA foresters are now applying management programs that increase water yields and control seasonal runoff to meet the needs of specific areas. They are installing devices that deepen snowpacks. They are cutting timber in patterns that accumulate drifts in clear-cut patches, which are protected against rapid melting and evaporation. They are altering vegetative cover to reduce water consumption by plants so that there may be more water for human consumption.

Management of these watersheds requires complete knowledge of watershed conditions and limitations. Watershed scientists survey and analyze National Forest watersheds and prescribe specific management techniques. They have selected some 50 watersheds as representative of different regions; on these, foresters are developing methods

of measuring watershed criteria so that they may serve as "barometers" of conditions throughout each region.

Corrective action against undesirable watershed conditions is another major activity. In 1966, this included sheet erosion control on 50,000 acres; stablizing more than 1,000 miles of eroding gullies, streambanks and lakeshores; and treating over 4,000 miles of abandoned roads and trails.

USDA's forest watershed management activities extend to other forest lands. It cooperates with State forestry agencies, forest industries, and private landowners to insure stable conditions through forest fire control, reforestation, and improved timber management. It also works with other Federal agencies on forestry aspects of other water-related programs. In many areas where forests cover most of the land, the success of watershed programs may depend on sound forestry programs.

## COST-SHARING AND CREDIT

Through cost-share and credit assistance the Department of Agriculture each year aids more than a million farmers and ranchers and many organized groups and communities in carrying out water conservation work that contributes to flood prevention and to the development, protection and management of a clean and stable water supply for home, farm, factory, and recreation. Financial assistance is available also for rural water supply and sewage disposal systems.

Measures eligible for financial assistance for the control of water runoff are equally valuable for the conservation and use of water and for the control of erosion. Practices on farms and ranches include: Establishing and improving permanent and temporary vegetative cover, planting trees, establishing sod waterways, building terraces, establishing strip-cropping and contour cultivation, and constructing ponds, pits, and sediment retention dams.

### Flood Prevention

Flood prevention as well as other water management benefits, is advanced through cost-sharing for measures that control water runoff and stream siltation. Among the cost-share practices being carried out by farmers as direct or indirect contributions to flood prevention are: Establishment and improvement of vegetative cover, tree planting, terrace building, and constructing dams and other water retention structures.

### Water for Livestock

Establishing ponds, pits, springs, dams, and wells for livestock watering are cost-shared to help protect vegetative cover by providing water resources for proper distribution of grazing. USDA assisted farmers in developing 50,000 such stock-water projects in fiscal 1966.

### Rural Electrification

USDA offers credit assistance to put water under pressure in the home, on the farm, and in industry and recreation. Control and protection of the water source, more efficient use of that source in the home and the field, and improved sanitary

conditions are chief benefits. The coming of the electric motor to rural areas through an orderly rural electrification program has helped to increase the percentage of rural establishments with running water from 17 percent to better than 80 percent in the past 30 years.

Irrigation

USDA helps develop ponds for better management of irrigation water. It also helps farmers level land, reorganize irrigation systems, and line ponds and irrigation ditches to conserve or use water more efficiently. Federal cost-sharing is not provided to bring additional land into production. More than 15,000 miles of irrigation ditches have been lined with USDA cost-sharing help during the past 30 years.

Drainage

Cost-share help is given to aid in establishing drainage -- both open and underground -- for land normally devoted to crops or pastures. But such assistance is not given to bring new land into production.

Wildlife Ponds

Cost-share aid is provided to develop or restore shallow water areas for wildlife, and to construct ponds or dams for wildlife habitat. Such ponds may be used for family or noncommercial fishing. Assistance was given last year in developing or restoring 2,729 shallow water areas, and in constructing 3,567 wildlife ponds or dams.

Water for Recreation

Farmers with ponds on land diverted to conservation uses may receive additional per-acre payments for permitting free public access to such ponds for fishing. Other farmland under the program may be used by the public for hunting, trapping, or hiking.

Greenspan

Water for recreation is provided also under a provision of the Cropland Adjustment Program known as Greenspan. Under it, public bodies -- local, State, or Federal -- may obtain Federal help in purchasing land previously used for crops that are in plentiful supply, if their plan is for permanent conversion to recreation, open space, and air and water pollution control. In addition to the land-acquisition help, cost-share assistance is also available to these State and local government agencies for carrying out the conservation practices the land will need in its new public benefit use.

Since Greenspan was inaugurated in 1966, 40 agreements have been approved with State, county, and local government bodies. About half of these agreements provide for water recreation -- fishing, swimming, and boating -- or wildlife ponds on part of the land being acquired under this program.

Water Conservation and Development Loans

Loans and grants are available for the development of community water and sewer systems, watershed projects, water resource development on individual farms and

ranches, community recreation developments, grazing associations, irrigation practices on individual farms and ranches, and grants for area planning for water and waste disposal developments.

## HELP TO OTHER NATIONS

In the spirit of the American farmer to "lend a hand" to his neighbor, USDA is cooperating in sharing its agricultural knowledge with other countries.

In the war on hunger, an essential weapon is water -- water for food production and water for processing food. Through its more than 100 years of service, USDA has acquired knowledge and experience in effective use of water.

Irrigation of arid lands offers hope for countries striving to develop agriculture to a point of self-sufficiency. USDA shares its irrigation and water conservation knowledge through training in this country agriculturists who will return home as specialists in the field, and through sending abroad technicians to organize programs in effective water use.

In all developing areas of the world USDA specialists are working with government officials, administrators and farmers to develop water resources. In Ecuador a water-use specialist trains Ecuadorans in effective irrigation techniques, watershed development, and water conservation. An American works with foresters in the Dominican Republic to reduce silting in rivers and reservoirs through proper management of watersheds.

USDA technicians are helping the Indian Government raise food production through a special soil and water research program, seeking ways to get needed water to crops. Conservation and proper use of water is high on the list of specialties studied by Indian agriculturists coming to the United States each year. In Thailand, four USDA specialists are helping the Thai Government develop a long-range soil and water conservation program in an effort to increase the productivity of agriculture. U. S. trained Thai leaders are helping farmers increase food production with improved irrigation methods coupled with effective fertilizer applications and good cultural practices.

There is tremendous agricultural potential in Africa, much of it blocked by lack of water. In countries generally considered tropical, large areas are arid -- there is water inside the country's boundaries, but not distributed in the same pattern as the population. Nigeria's agriculture, dominated by traditional farming methods, is being assisted by the Department. Four specialists are helping this developing country increase its agricultural production through a concentrated soil and water conservation project.

Nine USDA soil and water management specialists are helping farmers in Tunisia grow more food on their land, protect themselves from catastrophic floods, and take advantage of their water resources.

A strong partner of USDA's technical assistance projects in developing countries is the training of agriculturists -- more than 3,400 last year. Many of these men and women study ways to protect water in their home countries through irrigation techniques, flood control, and water storage.